Costs of Forage Production

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Introduction

Forage production costs form a major portion of the total cost of milk production on dairy farms. There are many methods available to produce forage, but most can be categorized as silage, dry hay, or grazing systems. For most dairies today, the primary forage is silage. Being a primary feed and a major cost, the economics of forage production can have a large influence on farm profit. Because of the many factors that influence production costs, a comprehensive analysis is needed to determine those costs. Such an analysis is best performed using DAFOSYM, a simulation model which integrates the many biological and mechanical processes on a dairy farm.

Materials and Methods

Long-term simulations with DAFOSYM were used to quantify the costs of forage production on Pennsylvania dairy farms. The model simulates crop production, feed use, and the return of manure nutrients to the land. Forage losses and nutritive changes, the timing of field operations, and the use of machinery, fuel, and labor are among the many factors tracked by the model to predict performance and resource use for typical dairy farms. Simulations were done for 22 weather years using Harrisburg, Pennsylvania weather data. Silage production costs were compared to those of alfalfa harvested in large round bales or grazed in a well managed rotational grazing system.

Two farms were modeled. The smaller farm included 100 cows plus 85 replacement heifers on 250 acres of owned land. Alfalfa was grown on 90 acres along with 160 acres of corn. The larger farm included 500 cows and 425 replacements on 450 acres of alfalfa and 750 acres of corn. Milk production was set at 22,000 lb/cow. Facilities included bunker silos for storing alfalfa and corn silages and a tower silo for high moisture corn. All alfalfa cuttings except the second cutting on the small farm were harvested as wilted silage. The second cutting on this farm was harvested as dry hay in large round bales. Corn was harvested as silage and high moisture grain to fill the available silos, and additional corn was harvested as dry grain.

A third farm was simulated which was a variation of the 100-cow farm that included grazing. All parameters of the farm were the same except that land use was changed to 150 acres of alfalfa and 100 acres of corn. Of the total alfalfa, 50 acres were grazed in the spring, 85 acres in the summer, and 150 acres in the fall after the third harvest. The remaining alfalfa was harvested with a three cutting harvest strategy using the same harvest methods and dates as used for the original 100-cow farm. Equipment costs included fence, watering equipment, and pasture clipping. Because field machinery was used less, cost was depreciated over 50% more time or 15 years.

Results and Discussion

Average costs of forage production on the three farms are illustrated in Figure 1. On the 100-cow farm, alfalfa silage was produced at an annual cost that varied over the 22-year simulation from \$76 to \$120/ton dry matter (DM) with a mean of \$85/ton DM. The predominant cost was that of machinery and the next largest cost was storage. Corn silage production was a little less costly, ranging from \$60 to \$124/ton DM with a mean of \$74/ton DM. Machinery, energy, and labor costs were less because mowing and raking operations were not required, and because the greater yield at harvest allowed equipment to be used more efficiently. Storage costs were a little lower for alfalfa because multiple cuttings allowed refilling of the silos, and thus more forage was stored in a structure.

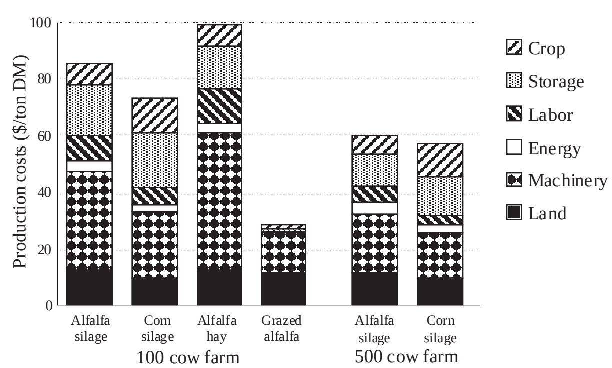

Figure 1. Production costs for different types of forage produced on two sizes of farms.

Hay production costs on the 100-cow farm were near $100/ton DM with a range in annual values from $83 to $167/ton DM. Machinery costs were higher because the baler and bale handling equipment were used relatively little. Hay can be produced more cost effectively when machinery is used for three or more cuttings per year.

Grazing was by far the lowest cost method of producing forage with a production cost near $30/ton DM. Annual values over the 22-year simulation ranged from $26 to $42/ton DM. Although grazing costs were quite low, they were only a portion of the total economic picture. Dairy farms in the northern U.S. cannot rely solely on grazed forage, so a substantial amount of hay or silage must be produced or purchased for the winter months. Despite the low production cost, grazing can reduce the profit of a high producing dairy farm by increasing other feed costs and reducing milk production.

On the 500-cow farm, where all four cuttings of alfalfa were harvested as silage using a self-propelled chopper and dump trucks for transport, alfalfa silage production costs dropped to $60/ton DM. The range in annual values was $55 to $82/ton DM. Machinery, labor, and storage costs were all reduced by producing forage more efficiently in greater amounts. Corn silage production costs were only a little less ranging from $48 to $95/ton DM with a mean of $57/ton DM. Again, compared to alfalfa silage, machinery, energy, and labor costs were less and storage and cropping costs were greater.

Conclusion

Silage production costs dropped as farm size increased with alfalfa silage costing a little more to produce than corn silage. The major cost in silage production was that of machinery which included depreciation, repairs and maintenance, and the next major cost was that of the storage structure.